# UPDATE REPORT

# PRIORITY TOXIC CHEMICALS OF CONCERN FROM ONTARIO POINT SOURCES DISCHARGING TO THE NIAGARA RIVER 1988

JUNE 1989

Environment Ontario

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## EXECUTIVE SUMMARY

A review of the sixteen Ontario point source dischargers to the Niagara River indicates that ten of those facilities contribute one or more of the priority toxic chemicals targeted for 50% reduction. Of those ten priority chemicals only tetrachloroethylene, mercury and hexachlorobenzene were detected at levels at or near their analytical detection limit. Total loading of these chemicals are tetrachloroethylene 0.176 kg/d, mercury 0.0011 kg/d and hexachlorobenzene 0.0002 kg/d. The remaining seven priority chemicals were below detection levels at all of the sixteen Ontario point source dischargers.

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## INTRODUCTION

The fundamental objective of the Niagara River Toxics Management Plan is to reduce the loadings of toxic chemicals to the Niagara River. The Declaration of Intent signed by the four agencies set a target of 50% reduction of persistent toxic chemicals of concern by 1996. Ten toxic substances have been selected for priority attention because they are present in the Niagara River/Lake Ontario ecosystem at unacceptably high levels. These toxic chemicals are found either in the Niagara River water column or in Lake Ontario sport fish at levels exceeding existing standards or criteria. Listed are the ten priority toxic chemicals that have been targeted for 50% reduction by 1996:

| | |
|---|---|
| benz(a)anthracene | mirex |
| benzo(b)fluoranthene | PCBs |
| benzo(k)fluoranthene | dioxin (2,3,7,8 TCDD) |
| benzo(a)pyrene | tetrachloroethylene |
| hexachlorobenzene | mercury |

The Niagara River Toxics Committee identified seventeen facilities as point source dischargers in Ontario that discharge directly into the Niagara River. Two of these facilities are no longer direct dischargers; Gould Batteries, which now discharges directly to the sanitary sewer for treatment at the Fort Erie (Anger Ave.) Water Pollution Control Plant (W.P.C.P.) and Holiday Farms, which has its own lagoon system for treating its process waste prior to spray irrigation. The Stevensville-Douglastown lagoon, which discharges into the Niagara River has been added as a point source discharge.

This report outlines which of the industrial and municipal facilities contribute one or more of the ten chemicals targeted for 50% reduction and what abatement measures are required to achieve that goal. Figure 1 illustrates the locations of point source discharges to the Niagara River/Welland River from Ontario. Results are based on the 1988-1989 point source monitoring data collected by the Niagara River Improvement Project. Dioxin (2,3,7,8 TCDD) was not included in the chemical analysis during the 1988-1989 monitoring period.

## LEGISLATION

In Ontario, the Environmental Protection Act and the Ontario Water Resources Act provide for the control of discharges to the natural environment. For example:

A) The Ontario Water Resources Act; Revised Statutes of Ontario, 1980, Chapter 361, Section 16
16.-(1), Every municipality or person that discharges deposits or causes or permits the discharge of any material of any kind into or in any lake, well, river, pond, spring, reservoir or other water or watercourse or on any shore or bank thereof or into or in any place that may impair the quality of the water of any well, lake, river, pond, spring, stream, reservoir or other water or water course is guilty of an offense. R.S.O. 1980, C.361,S.16(1); 1986,C.68, S.23(1).

B) The Environmental Protection Act; Revised Status of Ontario, 1896, Chapter 141, Section 13
13.-(1), Notwithstanding any other provision of this Act or the regulations, no person shall deposit, add, emit or discharge a contaminant or cause or permit the deposit, addition, emission or discharge of a contaminant into the natural environment that,

a) causes or is likely to cause impairment of the quality of the natural environment for any use that can be made of it;

b) causes or is likely to cause injury or damage to property or to plant or animal life;

c) causes or is likely to cause harm or material discomfort to any person;

d) adversely affects or is likely to adversely effect the health of any person;

e) impairs or is likely to impair the safety of any person;

f) renders or is likely to render any property or plant or animal life unfit for use by man;

g) causes or is likely to cause loss of enjoyment of normal use of property; or

h) interferes or is likely to interfere with the normal conduct of business. R.S.O. 1980,C.141,S.13(1);1983,c.52, s.4.

Control orders, program approvals and various regulations are the means used for the implementation of these acts.

Under the Environmental Protection Act, the Municipal-Industrial Strategy for Abatement (MISA) program has a goal of virtual elimination of persistent toxic contaminants in municipal and industrial discharges into Ontario waterways. This goal will be achieved through the development and implementation of regulations which include monitoring requirements and effluent limits. With the implementation of MISA, control and reduction of many of the ten target compounds will be achieved. Eleven of the sixteen Ontario point sources are included in the initial implementation of MISA. The facilities currently included under MISA are as follows: B.F.Goodrich Canada Inc., Canadian Oxy Chemicals Ltd. (Durez Division), Atlas Specialty Steels, Cyanamid of Canada Ltd.-Niagara Falls Plant, Cyanamid of Canada Ltd.-Welland Plant, Norton Abrasives, Washington Mills-Electro Minerals (Sohio), Fort Erie (Anger Ave) W.P.C.P., Welland W.P.C.P., Niagara Falls (Stamford) W.P.C.P. and Stevensville-Douglastown Lagoons.

A sewer use control program is currently being developed by the province to control industrial discharges into municipal sewage treatment plant systems, which in turn discharge into Ontario waterways. This program will include legislative requirements, implementation activities, enforcement mechanisms, resource requirements and information handling mechanisms. It will require industrial dischargers to virtually eliminate toxic contaminants from their waste by pre-treatment before they discharge to sanitary sewer systems. The sewer use control program, when implemented by the Regional Municipality of Niagara, will improve the effluent quality at the Niagara Falls (Stamford) W.P.C.P., Welland W.P.C.P, Fort Erie W.P.C.P. and Stevensville-Douglastown lagoons.

## SAMPLING METHODS

For the 1988-1989 monitoring period, both the influent or raw water supply and effluent were sampled at the industrial and municipal facilities. Composite samples were collected on a time proportional basis, using either grab samples or an automatic sampler, compatible for organic sampling, over three consecutive days. With the automatic sampler, the compositing period of 56 hours in total was subdivided into three periods of 24, 24 and 8 hours respectively. For the 24 hour compositing period, samples were collected every 20 minutes, while for the 8 hour period, every 6 minutes. The composite samples were collected in a 9 L glass container. In the cases, where the use of samplers was not possible, grab samples were collected and composited five times per day, over an 8 hour period.

Due to the nature of automatic samplers, it was inappropriate to use the sample collected by the ISCO 2700 for the analysis of volatile organic compounds. Volatile organic samples were therefore collected as a series of 5 grab samples over an 8 hour period each sampling day. The samples were then composited at the laboratory prior to analysis. The composited sample collected by the automatic sampler was used for all other analytical tests. Replicate samples were randomly collected and submitted for all analytical tests to ensure quality assurance and quality control requirements were met. All samples were chemically preserved in the field as required and kept cool after collection prior to transportation for analysis at the Ministry of the Environment Laboratory in Rexdale.

Flow measurements were taken in the field 4 to 5 times per sampling day over an 8 hour period where no permanently installed flow monitoring devices existed, otherwise actual 24 hour flow discharge data were obtained from records at the facility. The flow measurements were essential in order to determine the loading of contaminants to the receiving waterbody.

## RESULTS

Of the sixteen facilities, six showed "no detection" of any of the ten priority toxic contaminants targeted for 50% reduction. These facilities are:

Atlas Specialty Steels - Welland
Cyanamid of Canada - Welland Plant
Cyanamid of Canada - Niagara Falls Plant
Washington Mills - Electro Minerals (formerly Sohio (Canadian Carborundum)) - Niagara Falls
Stevensville - Douglastown Lagoons
Norton Abrasives - Niagara Falls

For the remaining ten facilities, only three of the ten priority toxics were detected; mercury, tetrachloroethylene and hexachlorobenzene. Table 1 indicates the facilities at which these compounds were found.

For the purposes of calculating point source loadings, the loading for compounds that were reported as "not detected" were assumed to be zero while for compounds reported as "trace", the loading was calculated at the detection limit. Values for average concentration, average flow and average loading for the three detected priority toxics at the ten facilities can be found in Tables 2, 3 and 4.

In other work carried out under the Niagara River Toxics Management Plan by different agencies, a wide range of detection limits has been used for the evaluation of these chemicals. A common level for detection is needed in order to implement, on an equal basis, the targeted 50% reduction of priority toxics into the Niagara River. The presence or absence of toxic contaminants will be dependent upon which agency or agencies are performing the analytical methods. It is recommended that the agencies through the Point Source Committee develop a consistent approach.

### Fleet Industries

Tetrachloroethylene is present in the discharge at this facility at levels of 0.8 ug/L. Groundwater at the site is known to be contaminated by tetrachloroethylene. Infiltration of groundwater into plant sewers is causing the detection of this contaminant in the effluent. Fleet is currently investigating the problem of contamination and has proposed using granular activated carbon treatment units to reduce the levels in the effluent. The Ministry of the Environment is assisting in the investigation and is consulting with the company to finalize the program.

## Niagara Falls (Stamford) Water Pollution Control Plant

Mercury was found in the effluent at levels at or near the detection limit (0.01 ug/L). The influent concentration is an order of magnitude higher than the detection limit . It appears that the majority of the mercury is removed by precipitation or adsorption to the sludge. Upstream sources of mercury have not been identified. Tetrachloroethylene was found in the effluent at concentrations varying from detection limit (0.1 ug/L) up to an order of magnitude above the detection limit. It appears in the effluent approximately 40% of the time. Its presence is due to discharges within the sanitary sewer system. When implemented, the MISA Sewer Use By-Law would reduce the influent levels, therefore reducing the effluent levels.

## Welland Water Pollution Control Plant

Tetrachloroethylene and hexachlorobenzene were found to be present in the effluent at levels of 0.03 ug/L and 0.005 ug/L respectively. The plant is currently being expanded to increase secondary treatment and nitrification capacity. This may resolve the problems through precipitation/ sedimentation. The expanded plant will also receive the additional flow from the McMaster Avenue combined sewer which as noted below contains both mercury and tetrachloroethylene. It is expected there will be no increase in effluent load from this facility, even though the influent loading is expected to increase. When implemented, the MISA Sewer Use By-Law would reduce the influent levels, therefore reducing the effluent levels.

## McMaster Avenue Combined Sewer

Mercury (0.03 ug/L) and tetrachloroethylene (6.00 ug/L) are present in the discharge. A Certificate of Approval was issued to the City of Welland with several conditions, one of which was that no overflow structures be installed. A Control Order has also been served requiring connection of the sewer to the Welland WPCP with the condition of no overflow structures. The City of Welland has appealed both the Certificate of Approval and the Control Order. The connection of this sewer to the Welland WPCP will eliminating this point source discharge to the Niagara River.

Fort Erie (Anger Ave.) Water Pollution Control Plant

Mercury and tetrachloroethylene are present in the effluent at concentrations of 0.03 ug.L and 4.90 ug/L respectively. The plant is currently being expanded to full secondary treatment. Levels of all compounds are expected to be reduced due to the expansion of the plant and should be removed by precipitation, degradation and adsorption. When implemented, the MISA Sewer Use By-Law would reduce the influent levels, therefore reducing the effluent levels.

B.F. Goodrich Canada Inc.

Trace concentrations of mercury were detected in the effluent at levels near the detection limit (0.01 ug/L). Mercury was also found in the raw water influent (Welland River) at similar levels. Based on the industrial processes at this facility, they are not believed to be a source of this contaminant. There are plans to double the capacity at this facility and to install an activated sludge process which would provide a better quality effluent.

Canadian Oxy Chemicals Ltd. (Durez Division)

Mercury has been detected (0.01 ug/L) in the plant effluent and from the storm sewer into which it discharges. Levels of mercury in the influent also appear sporadically at similar levels. Based on the industrial processes at this facility, they are not believed to be a source of this contaminant. This facility is currently implementing a 4R (reduction, reuse, recycle and recovery) program. They are close looping their water system to reduce consumption and are treating their effluent for phenol contamination.

Ford Motor Company of Canada (Niagara Glass Plant)

Levels of mercury were detected in the discharge from the process sewer effluent. These levels (0.02 ug/L) were slightly above the detection limit and appear to be consistent throughout previous Ministry surveys. Mercury was not detected in the raw water influent (Welland River) or in the lagoon effluent discharge. Tetrachloroethylene has been detected sporadically in both the process sewer and lagoon effluents at levels slightly above the detection limit (0.1 ug/L) and on one occasion at 3 ug/L. In all cases, it was not detected in the influent water. A survey should be conducted to determine if tetrachloroethylene is being used within the plant and if so, how it is entering the sewer system. An abatement program would then have to

be developed and implemented.

Stanley Avenue Sewer

Tetrachloroethylene was detected at concentrations of 3.30 ug/L in the effluent from this sewer. The sewer carries cooling water from Washington-Mills (Electro Minerals) and storm water from an adjacent industrial park. The MISA Sewer Use By-Law when implemtented would lower the levels of this contaminant.

Stelpipe Welland Tube Works

Low levels of mercury (0.03 ug/L) were found in the lagoon effluent. Based on the industrial processes at this facility, they are not believed to be the source of this contaminant. Hexachlorobenzene was found occasionally in the discharge. The processes again should not involve or produce this contaminant. A pilot plant study is underway to address the effluent quality. The study includes upgraded aeration lagoons, sand filtration, microscreening and granular activated carbon treatment before discharge.

## CONCLUSIONS

The concentrations of the three priority toxic chemicals found in Ontario point sources are in most cases at or near the analytical detection limits for those compounds. With the implementation of MISA, it is felt that the loadings of these compounds will be further reduced due to the monitoring and effluent limits regulations with which the facilities must comply. If implemented by the Regional Municipality of Niagara, the MISA Sewer Use By-Law would improve the influent quality and hence the effluent quality at the Water Pollution Control Plants. The abatement actions presently inplace will also help eliminate sources of these contaminants to the Niagara River.

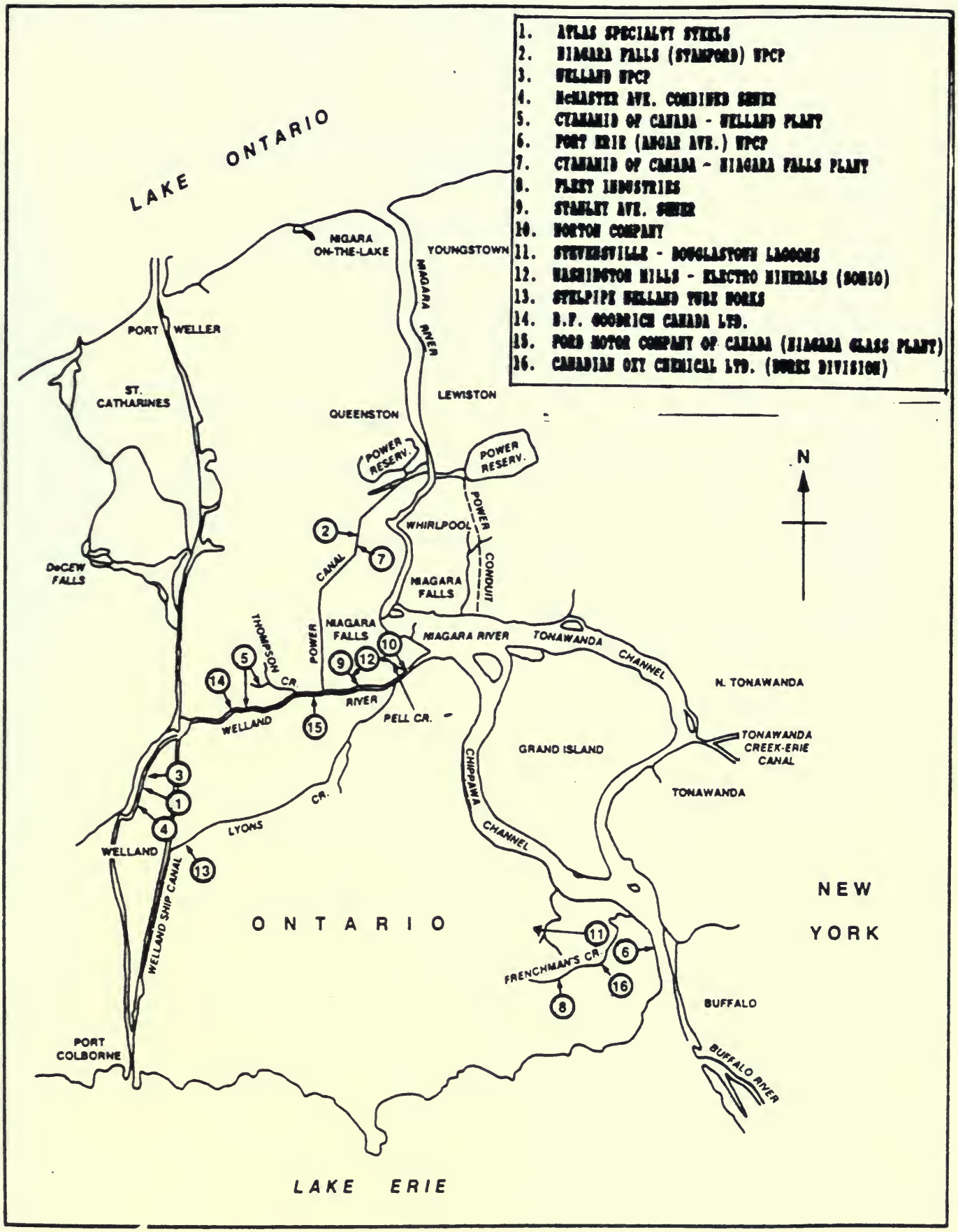


FIGURE 1: LOCATION OF CANADIAN POINT SOURCES TO THE NIAGARA RIVER

*TABLE 1*

## SOURCE OF CONTAMINANTS

| *Source* | *Contaminant* Mercury | Tetrachloroethylene | Hexachlorobenzene |
|---|---|---|---|
| Fleet Manufacturing | | x | |
| Niagara Falls (Stamford) WPCP | x | x | |
| Welland W.P.C.P. | | x | x |
| Fort Erie (Anger Ave.) WPCP | x | x | |
| McMaster Avenue Combined Sewer | x | x | |
| B.F. Goodrich | x | | |
| Canadian Oxy Chemicals - Durez | x | | |
| Ford Glass Plant | x | x | |
| Stanley Avenue Sewer | | x | |
| Stelco Welland Tube Works | x | | x |

*TABLE 2*

DISCHARGE LOADINGS OF MERCURY

| *Source* | Average Concentration (ug/L) (1988-89) | Average Flow (L/s) (1988-89) | Average Loading (kg/d) (1988-89) | Base Loading (kg/d) (1986-87) |
|---|---|---|---|---|
| Niagara Falls (Stamford) WPCP | 0.01 | 645 | 0.00056 | 0.00145 |
| Welland WPCP | ND | | | 0.00100 |
| Fort Erie (Anger Ave.) WPCP | 0.03 | 90 | 0.00023 | 0.00060 |
| Cyanamid of Canada (Niagara Falls Plant) | ND | | | 0.00025 |
| McMaster Ave. Combined Sewer | 0.03 | 92 | 0.00024 | 0.00023 |
| Ford Glass Plant | 0.02 | 14 | 0.00002 | 0.00013 |
| Fleet Industries | ND | | | 0.00011 |
| B.F. Goodrich | 0.03 | 32 | 0.00008 | 0.00008 |
| Norton Company | ND | | | 0.00003 |
| Stevensville-Douglastown Lagoons | ND | | | 0.00002 |
| Stelpipe Welland Tube Works | 0.03 | 2 | 0.00001 | ND |
| Canadian Oxy Chemicals - Durez | 0.01 | 1 | 0.00000 | ND |
| Total | | | 0.00114 | 0.00390 |

*Note: Detection Limit 0.01 ug/L*
*ND - none detected*

*TABLE 3*

## DISCHARGE LOADINGS OF TETRACHLOROETHYLENE

| *Source* | Average Concentration (ug/L) (1988-89) | Average Flow (L/s) (1988-89) | Average Loading (kg/d) (1988-89) | Base Loading (kg/d) (1986-87) |
|---|---|---|---|---|
| Fort Erie (Anger Ave.) WPCP | 4.90 | 90 | 0.0381 | 0.2034 |
| McMaster Ave. Combined Sewer | 6.00 | 92 | 0.0478 | 0.0726 |
| Niagara Falls (Stamford) WPCP | 1.00 | 645 | 0.0557 | 0.0510 |
| Ford Glass Plant | 0.07 | 14 | 0.0001 | 0.0083 |
| Welland WPCP | 0.03 | 372 | 0.0010 | 0.0040 |
| Cyanamid of Canada (Niagara Falls Plant) | ND | | | 0.0022 |
| Fleet Manufacturing | 0.80 | 7 | 0.0005 | 0.0004 |
| Stanley Ave. Sewer | 3.30 | 114 | 0.0324 | ND |
| Total | | | 0.1431 | 0.3419 |

*Note: Detection Limit 0.1 ug/L*
*ND - none detected*

*TABLE 4*

## DISCHARGE LOADINGS OF HEXACHLOROBENZENE

| *Source* | Average Concentration (ug/L) (1988-89) | Average Flow (L/s) (1988-89) | Average Loading (kg/d) (1988-89) | Base Loading (kg/d) (1986-87) |
|---|---|---|---|---|
| Fort Erie (Anger Ave.) WPCP | ND | | | 0.000030 |
| Niagara Falls (Stamford) WPCP | ND | | | 0.000028 |
| Welland WPCP | 0.005 | 372 | 0.000161 | 0.000020 |
| Stelpipe Welland Tube Works | 0.003 | 2 | 0.000001 | ND |
| Total | | | 0.000161 | 0.000078 |

*Note: Detection Limit 0.001 ug/L*
*ND - none detected*